

# Fundamental Properties of Water

## Chapter 1 - STUDENT OUTCOMES

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1. Understand the concepts of **atmospheric pressure** and **vapor pressure**.
  2. Recognize the difference between **latent heat** and **specific heat**.
  3. Explain the relationship between **density** and **specific weight** and transition between them.
  4. Describe the properties of a **Newtonian fluid**.
  5. Define **surface tension** and **compressibility**.
  6. Calculate solutions to various problems that involve these water properties.
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## Chapter 1

### Fundamental Properties of Water

#### Active Learning Exercise

In small groups, answer these questions.

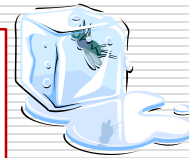
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1. What is the cause of atmospheric pressure?



2. What is vapor pressure? (State Henry's Law of Partial Pressure.)

3. What is the difference between latent heat and specific heat?



4. What is the relationship between density and specific weight?

5. What is a Newtonian fluid?

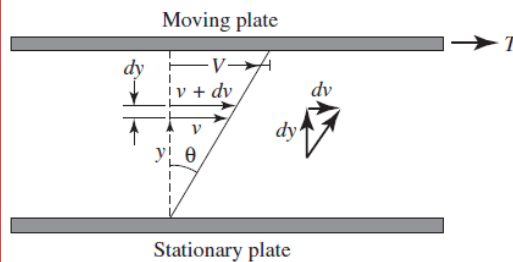


Figure 1.1 Shearing stresses in fluids

6. Is water compressible?

7. Identify two manifestations (i.e., visual evidence) of surface tension?



Water drops on a spider web.

Water is one of most unique and important substances on our planet. Three properties characterize its importance.

- a) A **high heat capacity** (it absorbs great quantities of heat without a large change in temperature).
- b) A **high dissolving capacity** (it is the universal solvent).
- c) A **unique temperature-density relationship** (its maximum density is at 4°C, unlike most substances which continue to get denser as the temperature is lowered).

8. Ramifications to our planet if water did not have a high heat capacity?

**Ans.** Extremes of heat and cold would exist; water moderates the earth's temperature.

9. Ramifications if water did not have a high dissolving capacity?

**Ans.** Plants and animals depend on nutrients that are dissolved in water and transported into them. Oxygen dissolved in water is critical to aquatic life.



**Painted Desert & Glacier Bay National Parks**

<http://www.nps.gov/pefo/learn/nature/environmentalfactors.htm>  
<http://www.nps.gov/media/photo/gallery.htm>

10. Ramifications to our planet if water did not have a unique temperature-density relationship?

**Ans.** Lakes would freeze from the bottom up destroying all aquatic life each winter.



**Ice Fishing for Northern Pike**

<http://www.state.nj.us/dep/faw/articefishpike05.htm>

**Quiz** next class.

**Homework**

**Problems:** 1.2.5,  
1.3.1, 1.4.6,  
1.5.3, & 1.6.1